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# Resilience from a Lived-Experience Perspective in the Regional Context of Dumfries and Galloway, Scotland

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## **Abstract**

Within the UK, academics and practitioners' understanding of resilience have been increasingly nuanced, particularly after the introduction of the Civil Contingencies Act (CCA) 2004. However, there remain debates and variations in how resilience is conceptualised that creates confusion in how resilience building is operationalised in practice by stakeholders. To address this concern, this study explores the meaning of resilience from the perspectives of people with a lived experience of flooding, through the lens of adaptive capacity, which is a key dimension of resilience as identified in Scottish policy frameworks. Insight from a literature review combined with empirical data collected from forty-three participants, suggests that resilience to natural hazards is a function of two inter-related aspects: 'information' and 'response' mechanisms. Further analysis suggests that resilience enhancement begins following receipt of risk information from either experience or other sources that shapes the understanding of a hazard and what protective steps to take. This *understanding* prompts behavioural responses influenced by 'risk attitude', 'skills' and 'access to resources' to enhance the adaptive capacity of the receiver. The paper engages in the complex debate about how resilience is conceptualized from the social sciences perspective. It presents a simplified account of what resilience means and sets out policy and practical implications of this.

**Keywords:** Resilience Enhancement; Adaptive Capacity; Risk Communication; Natural hazards; Disaster Risk Reduction

# **The Contested Nature of Resilience: Practical and Policy Challenges**

The construct of resilience has emerged as a popular term used in many policy areas (Brown, 2012; Prezelj & Doerfel, 2017) including disaster risk reduction at the international, national and local levels (Aitsi-Selmi, Egawa, Sasaki, Wannous, & Murray, 2015; Djalante, Holley, & Thomalla, 2011). However, some have criticized the fact that policy practitioners are incorporating resilience as a central element of policy without a grounded theoretical and empirical understanding of the term (Brown, 2012). Resilience is often used as an umbrella term covering many aspects of bouncing back and adapting to the environment (McCubbin, 2001) such that the ‘resilience’ has become an ambiguous term with no specific meaning.

Some see the ambiguity around resilience as an opportunity where resilience can be tailored within its local context of use (Tanner, Bahadur, & Moench, 2017). On the contrary, this has raised some concerns amongst critics who caution the use of resilience as a ‘guiding framework’ (Tanner et al., 2017). For example, conceptualizing societal issues through the lens of resilience has been blamed for reframing issues in a way that makes a vulnerable population responsible for protecting themselves. Using this lens, reduces the importance of the role that authorities can play in fostering or undermining resilience. In fact, earlier research by Methmann and Oels (2015) in their study of ‘climate refugees’ claims that resilience shifts responsibility to a vulnerable population, deprives them of their (human) rights and inhibits a more comprehensive engagement with the structural issues that drive the very (societal) problem by normalizing them. Furthermore, resilience as a lens undermines the powerful interplay between multiple variables on different temporal and spatial scales that can make even those perceived to be the most resilient, vulnerable to harm.

This paper approaches resilience from the social science perspective and engages in the complex debate around how resilience is conceptualized. The paper begins looking at how resilience is conceptualized within Scotland’s policy context. It also sort to understand attributes of resilience and its relationship to adaptive capacity within existing literature through a systematic literature review. Through primary

research conducted in the regional context of Dumfries and Galloway, the paper then examines resilience attributes from a lived experienced perspective. Thus, the paper contributes to the understanding resilience as a broad concept and examines its practical application.

## **Policy framing of resilience as ‘Adaptation’**

In United Kingdom (UK), resilience development is underpinned by the Civil Contingencies Act 2004 translated in Scotland as the contingency planning Scotland regulation in (2005) (Scottish Government, 2013). This Act redefined ‘roles and responsibilities’ for emergency planning, shifting responsibility from the central/national government to local authorities and communities (Edwards, 2009; Whitehouse, Bowers, Throp, & Settle, 2015). The policy framing of resilience both in Scotland and at the UK-wide level, is one and the same where resilience is seen as “the capacity of an individual, community or system to adapt in order to sustain an acceptable level of function, structure and identity” (Building Community Resilience Report, 2016 p.3). This definition emphasizes ‘adaptation’ and focuses on the outcome rather than the process by which the adaptation occurs. The definition also stresses the ‘sustainability’ of function, structure and identity in a way that highlights ‘maintaining way of life’ following an emergency.

Given UK’s Government policy framing of resilience, this paper will address the adaptive dimension of resilience; other resilience dimensions are - absorptive and transformative capacities, see (Bene et al, 2013). Moreover, this study, which aims to understand the lived experiences of people who have suffered flooding, is more inclined towards an adaptive capacity framing of resilience. This is because learning is key but it takes time to incorporate new lessons into planning – which corresponds more to a timescale of delayed adaptation as opposed to coping.

## **The relationship between adaptive capacity and resilience attributes**

Adaptive capacity is the capacity to manage or mitigate the threat to harm through interaction with the environmental and social system (Walker, Holling, Carpenter, & Kinzig, 2004). Adaptive capacity facilitates transitions into a new state, i.e. transformation (Folke et al., 2010) especially where resilience is seen as a process instead of an outcome. Engle (2011) identifies two types of adaptations: anticipatory and reactive adaptations that are linked and complementary. Anticipatory adaptation, also known as ‘planned adaptation’ (Fankhauser, Smith, & Tol, 1999), happens by anticipating future disturbances and making adequate plans to reduce exposure to potential harm. Reactive adaptation, on the other hand, occurs when responding to stress that has already occurred. There is also the danger of maladaptation (Rappaport, 1976), where mitigating steps do not reduce but instead amplify the effect of harm. For this reason, adaptation is seen as a complex process (Barnett & O’Neill, 2010) that may occur at different scales and within competing social contexts (e.g. risk culture, values and knowledge) (Adger et al., 2009).

Numerous factors including financial resources, information, knowledge, skills, infrastructure, and systems (institutions, governance or management) are identified as attributes of adaptive capacity, see for example, (Engle & Lemos, 2010; Gupta et al., 2010; Miao, 2017). At the community level, social capital, trust, and organising processes are additional factors that shape adaptive capacities for communities to act collectively (Pelling & High, 2005). These factors contribute to how we learn and take adaptive steps to reduce the threats from potential harm. The study therefore makes an attempt to categorise adaptive capacity attributes, as identified in extant literature, into three broad categories (see Figure 1). These are: the ‘information and knowledge’ of potential risk and what protective steps to take, and ‘skills and resources’ (which may be financial, materials/infrastructure, skills, social capital, or management processes). A third category is what Mortreux and Barnett (2017) term as psycho-social variables: risk attitude, trust and expectations in authorities, place attachment, household compositions and competing concerns - that translate the capacity in the first two categories into actions or outcomes. The sixth psychosocial variable, ‘personal experience’ as identified by Mortreux and Barnett (2017), is classified under ‘information and knowledge’ in this study.

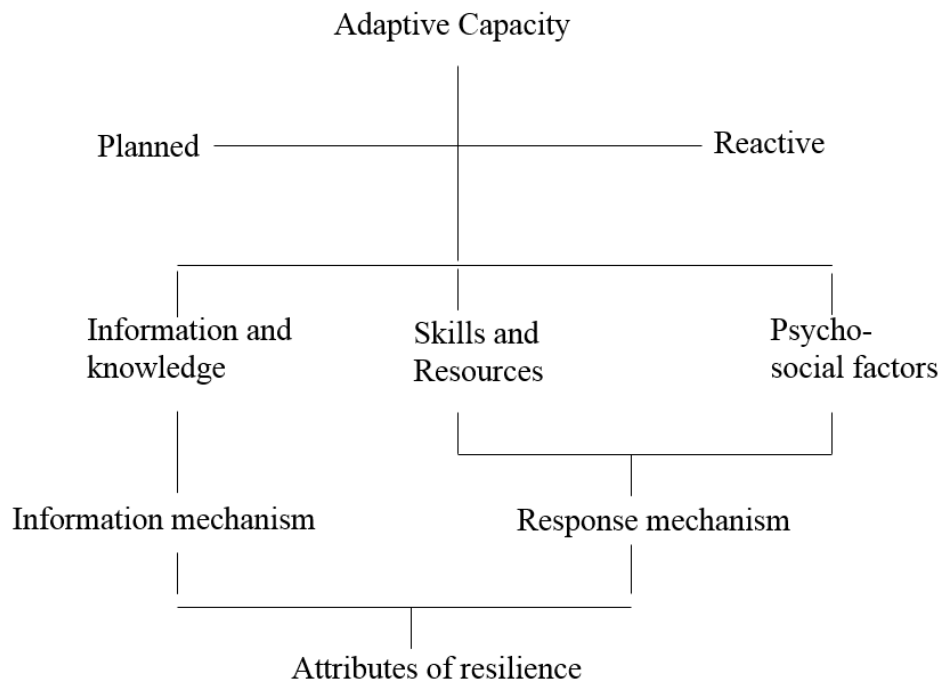


Figure 1: The relationship between resilience and adaptive capacity attributes

Information and knowledge, skills and resources and psycho-social factors are further divided into two broad themes: the ‘information’ and ‘response’ mechanisms. This categorization is further strengthened through a systematic review of extant literature conducted as part of this study (see Supplementary Material (SM) Table 1). The aim of the systematic review is to identify attributes of resilience and its relationship to adaptive capacity within existing literature base. The review was carried out by searching several combinations of relevant criteria using Scopus Database; some of which includes resilience, adaptive capacity, information, knowledge, skills, resources and natural hazards. A further selection criteria included articles published peer reviewed articles between 2013 and 2018. Attributes of resilience as identified in see SM Table 1 are then, further categorized under the information and response mechanism SM Table 2.

This study proposes that enhancing the resilience of people or communities consists of these two broad aspects that are linked and which influence each other; a process that contributes to what this study term as ‘Resilience Enhancement’ (RE). Resilience enhancement signifies a phenomenon where individuals or communities have the capacity to act upon received resilience information to effectively reduce the threat

from potential harm. The structural description of resilience, modelled after the social amplification of risk framework (Kasperson et al., 1988), helps simplify the ways in which we talk and view resilience from the social science perspective and act as a significant first step towards developing a practical understanding of resilience. The idea of resilience as a function of ‘information’ and ‘response’ mechanism is worth testing out to see if this framework could ultimately be used in the future as a more coherent resilience theory.

## **Research Question**

The study therefore makes a first attempt to test the idea of resilience as a function of the ‘information’ and ‘response’ mechanisms. The research questions are objectively designed after the Gibbs reflective model (Gibbs, 2000). This model allows for description, analysis and evaluation of the experience of the participants, helping them to make sense of their experiences and examine their actions (Gibbs, 2000). It also allows participants to think about how to put their experience to good use if similar situations arose again. Using Gibbs’ model reduces the degree of researcher’s influence on the nature of questions and thus, data that will be asked of participants. Participants were asked to describe their experience of the flooding event, including their feelings, and analysis of events identifying enablers, barriers and challenges in preparing for and recovering from the flooding. Participants were also asked to give recommendations for practical steps to help them feel better prepared for and informed about future occurrences. Ultimately, the study seeks to answer

What does resilience mean from the lived experience perspective of flooding and how can this be enhanced?

## **Context of Study**

This study investigates public experiences of the December 2015 flooding in the Dumfries and Galloway region of Scotland. This flooding is unique and relevant because it is recent and there were a number of flooded communities across the region, which meant that there was a council-wide rather than a targeted area approach to the response. This means that resources were stretched, providing an

important context for understanding community resilience. The event also occurred at a time where most public employees were expected to be on holiday and the first time a severe flood alert was first issued in Scotland following the placement of the current flood line system, meaning lives were at risk.

## **Dumfries & Galloway Region**

Dumfries and Galloway is a mostly rural region in southwest Scotland with a population of approximately 149,670 (Dumfries and Galloway Council, 2016). Approximately 47% of people in Dumfries & Galloway live in areas classified as rural and remote (settlements with fewer than 4,000 people). The region has experienced a number of flooding events over the last few years. As such, flooding is used as the situational context to investigate natural-hazards in this study. Flooding has been identified as a major threat to local communities in the UK (Lo & Chan, 2017). According to the Centre of Research on the Epidemiology of Disasters (CRED), flooding accounts for 43% of all natural disasters occurrence between (1994 – 2013), affecting 2.4 billion people worldwide that resulted in 160,000 deaths (UNISDR, 2015).

The impact of natural-hazards such as flooding can be particularly acute for rural and remote communities for several reasons (Twigger-Ross, 2004). Firstly, there is a higher percentage of older people (above 65 years) and those living alone, which reduces ability for self-help. The elderly are also more likely to suffer the health implications associated with flooding disruptions. Secondly, businesses in these communities, typically small and medium enterprises (SMEs), are more likely to be impacted by severe weather due to limited resources for business contingency plans. There is also the distant proximity to public and emergency services which means that the population will have to rely on self-help for a longer period of time before emergency help arrives. Finally, the appraisal process, typically based on property prices, tends to put policy emphasis on urban and richer communities. For this reason, urban (flood) defenses are often more developed in urban than rural communities. Together, these factors lead to more anxiety in rural communities about natural-hazards such as flooding.



Despite this, resilience research has tended to focus more on urban communities (Sharifi & Yamagata, 2016). For this reason, the Dumfries and Galloway region provides a highly relevant context in which to explore the understanding of resilience from the lived experiences of an at 'risk population' and within a rural context.

## **Methodology**

The study was reviewed and approved by the College of Social Sciences Research Ethics Committee of University of Glasgow.

### **Selection of Communities**

The researcher approached community council members of five communities identified as having experienced flooding within the last three years, following an online search to identify the right persons. Responses were received from both Newton Stewart and Creetown where representatives were willing to participate in the research and help facilitate data collection on a personal level. Therefore, the selection of these communities was purposive (Etikan, Musa, & Alkassim, 2016) and opportunistic (Kemper, Stringfield, & Teddlie, 2003). Newton Stewart and Creetown are both classified as 'remote small towns' following the Scottish Government Urban/Rural Classification 2011-2012.

Newton Stewart is located on the banks of the River Cree on the southern edge of the Galloway Forest Park with a population of approximately 4100 people (Dumfries and Galloway NHS, 2014). The River Cree is the major source of flood risk in Newton Stewart. The main local industries in the area are agriculture, forestry and tourism. The town also has a market, and a number of services supporting the farming industry. In 2007, Dumfries and Galloway Council commissioned a Strategic Flood Risk Assessment. Newton Stewart and Minnigaff were identified as priority areas in terms of the number of properties potentially at risk of flooding. The Newton Stewart Potentially Vulnerable Area mapping by the Scottish Environmental Protection Agency (SEPA) puts 210 residential and 70 non-residential properties at risk of flooding. Flooding was recorded in November 2012, December 2013 and 2015

affecting both residential and business properties. Creetown, a small seaside town, has a population of about 700 people. It is located just 7 miles from Newton Stewart. It has a population of about 700 people (Dumfries and Galloway NHS, 2014). In SEPA's Potentially Vulnerable Area mapping, there are approximately 90 residential properties and 20 non-residential properties at risk of flooding in Cree town. Coastal flooding was recorded in January 2014 and July 2015 (twice in 18 months) impacting mostly on residential properties.

Both Newton Stewart and Creetown are communities within the Wigtownshire area; therefore, they share similar socio-economic, environmental and political characteristics. According to the 2011 census data, 23% of population in Wigtown is above 65 years, 25% describe themselves as disabled or having long-term health problems and 61% of the employable age group (16-74) are in employment. Employment in health/social work and wholesale/retail account for the largest proportion, followed by agriculture, forestry and fishing. Galloway Forest Park lies within this region, characterized by rocky coastlines. Other areas are Stewartry, Nithsdale and Annandale & Eskdale as seen in Figure 2. Around 24% of people living in the Wigtownshire region are classified as income deprived, representing 4500 of the over 18500 people classified as income deprived in the Dumfries and Glasgow region according the 2011 census data, see Hill and Clelland (2015).



**Figure 2: Map of Dumfries and Galloway**  
**Source: Crichton Institute: Wigtownshire local area profile**

## Selection of Participants

Semi-structured interviews were conducted with nineteen local residences including seven business owners from Newton Stewart and Creetown. Within this, there were four community members of the local councils who presented personal views on the research themes. Further responses were collected from twenty-four individuals through a semi-structured survey, five of which indicated owning a business that was affected by the flooding. Four of the forty-three participants interviewed experienced the flooding in Creetown. The numbers of participants in both communities is a representative of the total population and those affected by the flooding in the communities. In addition, local contacts in Newton Stewarts were especially proactive in helping the researcher gain access to flooded locals. Eighty percent of the participants were above 45 years reflecting the aging population of the region as noted in the 2011 census data.

The forty-three participants (see Table 1) were identified based on their engagement with, and experience of the flooding. While these numbers are relatively small

compared to the combined population of both communities, they are sufficient and justifiable when referring to the percentage of those affected by the flooding. For example, local anecdotal report estimates that 48 out of the 50 commercial properties in Newton Stewart, located on Victoria Street were affected by the flooding, five of which never re-opened. Therefore, data collected from business owner represents about 30% of business residence affected by the 2015 December flooding. The sample numbers are also justifiable due to the nature and quality of data collected (Morse, 2000). Furthermore, Guest, Bunce, and Johnson (2006) in an experimental study concluded that saturation occurs within the first twelve interviews.

Representatives of the community council facilitated identification of potential candidates for the interviews based on their local knowledge of areas affected by the December 2015 flooding. The Semi-structured interview was chosen as the key research method to allow the researcher to tease out issues of research interest in greater depth. It also enables participants to raise specific issues that were unique to them (Cohen and Crabtree 2006). The interview recordings were professionally transcribed and the resulting transcripts reviewed by the researcher for accuracy. The researcher took advantage of the ‘Day of the Region’ event in Newton Stewart to collect further data through semi-structured surveys, some of which were conducted face-to-face and others on a self-completion basis. The ‘Day of the Region’ event initiated in 2011 by Dumfries and Galloway LEADER Local Action Group (LAG) aims to promote the celebration of rural communities in Dumfries and Galloway.

**Table 1: Total number of participants**

Interviews			Rep. of community council (RCC)	Survey	Total
Newton Stewarts (NS)	Individual residents (R)	6	2	19	30
	Business owners (B)	6	1	5	
Creetown (CT)	Individual residents (R)	3	1	0	3
<b>Total</b>	15		4	24	<b>43</b>

## **Analysis**

The data were analyzed using an inductive approach (Thomas, 2006) and thematic analysis (Braun and Clarke, 2006). The analysis of the data begin by first reading the transcripts and this led to the identification of codes (resilience attributes) that were grouped into sub-categories (information and knowledge, skills and resources) and then further grouped under broader categories as they related to attributes of 'information' and 'response' mechanisms as identified in the literature review (see Supplementary material Table 3). The survey was intentionally designed in a semi-structured manner to capture a larger range of inputs. Data from the surveys were extracted verbatim. The analysis and interpretation of the data were also informed by insight from the systematic review of peer-reviewed journal articles on risk and resilience using the Scopus Database (as seen in Supplementary material Table 1 and 2). This enabled the finding of the study to be situated within existing evidence base.

## **Results**

The results represent key themes around enablers, challenges and barriers, actions taken before and after the flooding event, and recommendations on way forward. The core message in this study is that resilience to natural hazards is largely a function of two inter-related aspects: the information mechanism and the response mechanism. Consequently, any resilience policy that fails to acknowledge the importance of both aspects will limit the ability to maximize opportunities for enhancing resilience to natural hazards in local communities.

### **Findings related to the Information Mechanism of Resilience**

The key themes categorized under information mechanism results are: awareness, prior experience, knowledge and understanding of - flooding, the likelihood for occurrence, its consequences, and what protective steps to take before and after a flooding event.

## Enablers

Twenty-four out of the 43 respondents provided information on enablers related to information mechanism. The most representative themes were local knowledge of weather elements prior to flooding, information, and early predictions and warning.

*“We look at the tide timetable ourselves so that it is predictable what the tide heights are and it is a combination of tide height and wind that cause the tidal flooding” (CTR2 –Creetown residence Interviewee 2).*

*“You can see the river going up and down, so you can almost tell if it’s going to flood” (NSR4 – Newton Stewart Residence Interviewee 4)*

*“Advance warning of flooding” (Survey)*

This suggests that the tide time prediction is a useful early warning signals and this combined with local knowledge of weather elements leading up to flooding can prove to be an effective risk reduction information source.

## Barriers and Challenges

Twenty-three respondents provided information on barriers and challenges related to the information mechanism. The most representative themes were lack of knowledge that flooding could occur in the local area or affect their properties, limited understanding of what protective steps to take, lack of early warning and limited time to take protective steps in the immediate period before flooding,

*“I wasn’t aware that it was something that ever happened here” (NSB1 – Newton Stewart Business interviewee 1).*

*“Had we known a night before, had they brought sandbags even to the street, so many people would not have been affected” (NSB2)*

*“Somebody the night before said that the water was going too high the next day but you don’t think that it is going to come in your front door.” (NSR3)*

*“Nobody said it was better to do ABC. We were left to deal with it on our own” (NSB4)*

This confirms that information is key to individuals or communities taking an effective ‘planned’ or ‘reactive’ adaptation to flooding. There was also the notion of “this will not happen to me” (NSB2) suggesting that the acceptance that flooding may

occur is not universal within the community despite the proximity of the community to a local river. In addition to this, there is public expectation of the government to 'fix' the problem when flooding actually does occur, adding to the complacency of those potentially at risk. This was noted in one of the representatives of the community council (RCC) comments' who stated that

*"Well, I know everybody's supposed to help protect their own property, but I don't think the public are really aware of that. And, generally speaking, won't be doing much about that. They'll be looking to the authorities to help..." (NS - RCC1).*

#### Actions taken after the event

Participants were also asked to describe actions taken after the flooding event. All the 19 respondents interviewed have now signed up to SEPA "flood line" for alerts and some purchased a "flood gate" through government subsidised schemes. Other have sandbags in their premises, mainly left over from the previous flooding

*"[After the flooding,] I joined the flood line" (NSR3)*

There was also the redesign of flooring to be water resistant (e.g. use of wooden or concrete floors), lifting sockets, television and valuable goods off the ground and installing water resistant floors

*"We lifted the television up off the ground. The sockets are lifted as well when they redone the house" (NSR3)*

This confirms that past experience increased knowledge of what potential harm could be and what protective steps are needed. This also increased motivation and willingness to prepare for future disruption

*"Because I have dealt with it once, I think the second time will be slightly easier because I know the process of what to do first (NSB1).*

#### Recommendations

Twenty-nine respondents provided recommendations related to information that could make them feel better prepared and informed in the event of future occurrence. Responses ranged from early but accurate localised flood warning, the need for a clear

and simple message and provision of one-to-one advice about how to protect one's property from flooding.

*“More information before these events occur [and] about what steps to take” (survey)*

*“Get somebody knowledgeable about flooding may be from SEPA to advise us – one-to-one advice” (NSB5)*

*“Get localised alert, may be [use] town criers” (NSB3)*

*“Digital information board in town centre showing events and information” (Survey)*

There was also the desire to keep the *“profile of community resilience at the forefront” (Survey)* of public discourse, a national information coordinating body and the need to ensure that information reaches those that needs them

*“I don't want to be fed stuff [information]... but need as I keep saying a focal point. If I get an issue with something, I speak to that person or organization. I don't want to go to SEPA who would say we deal with this, that and go to council for that... By the time you have done two or three you will say well, why I should bother (NSB4).*

*“They are doing a lot of good things but not telling people, they need to see where it goes and its reach.” (NSB3).*

## **Findings related to the Response Mechanism of Resilience**

Findings categorized under the response mechanism were those that enabled participants to take protective steps before or after the flooding event.

### **Enablers**

Twenty-three out of the 43 respondents identified essential protective steps taken before and after the flooding: attitude, time, finance, fitness and government flood management schemes that allowed residents to purchase flood protection equipment at a reduced price prior to the flooding. Additional data are provided in SM Table 3.



*“I am quite a strong person [...] I just gather myself together and you pick yourself up, dust yourself down and start again.” (CTR3).*

*“Time” (survey).*

In the aftermath of the flooding, all respondent pointed to community spirit (or social cohesion) where friends, family and members of the community pulled together to help those affected.

*“My neighbor was very good. He put my house back together” (CTR3).*

*“My son came down to help” (NSR1)*

In addition, three respondents in the survey identified that they now store their plants in moveable containers for quick removal if need be and electric meters moved upstairs. Prior insurance cover was found to be very helpful in restoring households back to normal.

### Barriers and Challenges

Thirty respondents identified barriers and challenges in taking protective steps before and after the flooding event. These include cost, physical ability and lack of preparedness on the side of regional council especially in the distribution of sandbags prior to and in the immediate aftermath of the flooding.

*“I am not as young as I used to be, I have retired. I am having problems getting in and out the bath. The stairs are a problem. You have to jump up on the units to open and shut your windows.” (NSR3)*

*“The preparedness for it. Sand bags were difficult to get... They [sandbags] were there but there weren't allowed to give them out because they weren't authorized to give them” (NSB4)*

The issue of council distribution of sandbags confirms that individual ability to take an effective response steps is also linked to community-level organisation. Furthermore, individual preference also acted as a barrier to taking protective steps from flooding. One business owner suggested he would rather invest money in his business to make profit than invest in floodgates that may be ineffective in protecting his property from flooding. Another respondent lamented the inefficacy of business continuity plans in such a scenario. He explained, “Even if I am smart [to have a

continuity plan], people can't get to the street because it's closed and my stock will still be wasted" (NSB3). Other barriers as identified in the survey are "finance", "absence", "lack of physical fitness", "limited time and physical effort, and limited options for effective's preventive actions".

Twenty-one out of the 43 respondents provided recommendations that would enable people to take prior protective actions. Some of the recommendations were to give individuals power to protect themselves, financial aid, river management, and to have effective local procedures to manage the flooding

*"Give people the power to protect themselves. People are willing and able to protect themselves but they are stopped because of red tape and the idea that the risk could be transferred to others" (CTR2),*

*"Provide financial help...even at subsidized cost [for the flood protection scheme], I just don't have that money" (NSB1)*

*"Put effective local procedure to help the community and individuals" (survey)*

*"River Cree can be dredged (survey)*

## **Discussion: Policy and practical implications**

This study advances our understanding of resilience by presenting accounts of how people and businesses within communities plan (or not) their adaptation strategies to flooding in a regional context of Dumfries and Galloway. However, the findings have a broader relevance. The study revealed that there were both planned and reactive adaptations in response to the 2015 December flooding. The study found a relationship between planned adaptation and prior knowledge of: the likelihood that flooding may occur, its consequences, and what protective steps to take before and after a flooding event. This prior knowledge enabled some of the local residents including business owners, to take protective steps including raising socket locations in their houses, replacing floor coverings with water resistant flooring, and storing sandbags within premises. Consequently, there is the need for policy makers and

resilience practitioners to consider how to promote prior learning opportunities for an effective planned and reactive adaption to natural hazards such as flooding.

Within this, there is the need to clarify and communicate responsibilities of authorities and likewise, the public in a way that is clear and unambiguous. The importance of prior knowledge and understanding has already been echoed in extant literature see, for instance, (Arbon, 2014; Bastaminia, Rezaei, & Saraei, 2017; Cutter, Burton, & Emrich, 2010). In addition, early warning signals were also identified in the study as key to both planned and reactive adaptations. The data show that early warning signals may arise from local knowledge of the weather element prior to flooding; word of mouth or other mediated early warnings (such as flood alerts). The argument made here is that planned and reactive adaption is contingent upon the information mechanism of resilience. This suggests that there is the need for a coordinated approach in how messages related to resilience and safety are communicated to best support individuals or businesses in their preparation for, and recovery from flooding. Encouraging learning and engagement beyond emergency period is key to promoting prior knowledge and understanding before any emergency (McNulty & Rennick, 2013).

The data also confirms that both individual and community-level planned adaptation are crucial to taking effective reactive measures especially where organizing at community level is needed (such as the distribution of sandbags), see Kulig and Botey (2016). The implication of this is that, regardless of prior knowledge of the possibility of flooding and what protective steps to take, without timely access to the needed resources, the possibility of taking an effective reactive measure could be curtailed. Likewise, a reactive measure will be ineffective where there is limited community-level engagement with individuals needed resources to protect themselves. As community-level organisation influences individual adaptive capacity and vice versa, there is the need to promote basic prior protective behavior (such as putting sockets at a height, using water resistant floors. This way, planned adaption will reduce the need for a reactive measure (or adaptation) during emergencies.

The data also suggest that effective reactive adaptation is contingent upon both information and response mechanisms being in place. An early warning signal is key

to an effective in the immediate period before a disruption. The study found that attitude (motivation, willingness, preference and commitment), skills (extent of imagination, creativity, fitness and technical/local expertise) and resources (access to social capital, critical infrastructure, finance, material and rules, regulation and governance) are enabling factors to both planned and reactive adaptive capacity, see also, (Arbon, 2014; Bastaminia et al., 2017; Cutter et al., 2010; McNulty & Rennick, 2013). Furthermore, the fact that our understanding of resilience does not only arise from prior experiences but also indirectly through other sources, raises concern around how resilience messages are encoded, transmitted and decoded and feedback made available. For this reason, future research should seek to understand the power dynamics that shape how resilience is measured and understood in order to help shape resilience planning.

One interesting finding which is not exclusive to this study was the identification of physical fitness as an enabler of resilience, see Robson (2013). This offers another rationale for promoting physical fitness and suggests that there is a place for physical education in developing individual and community resilience. However, there is a limit to this, for instance, as in the case of the Dumfries and Galloway with an aging population or if people have disabilities. Another interpretation might be to try and reduce the risk of those who are less physically fit in other ways in the resilience planning process. Common sense and imagination were also mentioned as ways of dealing with the flooding. However, there are vulnerable groups that may not have such an ability to deal with the aftermath of the flooding and they need to be identified and supported.

In coping with the aftermath of flooding, respondents pointed to social cohesion in terms of help from friends, family, members of the community and relevant emergency services. However, the data suggest that there are some who felt embarrassed or uneasy to accept help. For instance, one respondent felt so embarrassed to accept help from local residents who came to help clean her store in the aftermath of the flooding because “it was too disgusting” (NSB1). This suggests that there may be a need to communicate with people on the importance of social capital in emergencies and reassure them that it is acceptable to receive help in distressing circumstances.

In terms of barriers, respondents pointed to a lack of early warning, or lack of knowledge that their property may be flooded or even what to do to protect their properties. This is similar to the findings of Lorenzoni, Nicholson-Cole, and Whitmarsh (2007), pointing again to the importance of awareness raising in developing resilient citizens and communities. There was also an issue of cost, especially financial cost, which acted as a barrier to homeowners in making their properties flood resilient. This suggests that insurance and government-subsidised schemes play important enabling roles in the aftermath of a disruptive event. However, attention should be paid to those who are still unable to afford even subsidized products. More effective measures for disaster financing are therefore required (Michel-Kerjan & Kunreuther, 2011).

Furthermore, resilience practitioners (such as policy makers, community resilience officers and community leaders) may wish to consider how they can learn from resilience enhancement theory to enhance the resilience of individuals or communities to natural hazards. Of importance is the fact that the needs of different communities (regardless of variations in how they are defined) will vary. For instance, a community that has experienced several severe weather impacts is likely to have an understanding of the hazard, know the potential consequences and what protective steps to take to reduce exposure to the threat. In such a scenario, resilience practitioners may want to put more emphasis on strengthening the response mechanism for those at risk. However, where there is little or no experience of a hazard, it may be valuable to start from an information mechanism, extending this to the response mechanism. It is also possible to focus on both aspects simultaneously, especially where cost reduction is not an immediate priority. An initial step may require an assessment of these two broad domains of resilience enhancement: (a) an assessment of existing information mechanisms (that may include prior experience of events in communities, public discourse, school curricula and media campaigns and (b) the assessment of the ability and capacity of those at risk to access relevant resources to take protective measures (such as access to finance, knowledge and expertise). The analysis and discussion carried out in this study suggest that resilience enhancement propositions were useful in explaining how individual residents and

business owners might develop and reach adaptive capacity and thus, resilience to natural hazards.

## **Conclusion**

One of the key issues within the resilience community (both academic and policy) is concern around the variations in how resilience is conceptualized. Such variations often create ambiguity and then, confusion in how to operationalize resilience in practice by local resilience practitioners. This paper engages in this complex and evolving debate from a social science perspective and contributes to the understanding of resilience from a lived experience perspective of flooding in the regional context of Dumfries and Galloway. The findings have global relevance to our understanding of resilience as a broad concept and especially around how to apply resilience in practice. Insight from the literature review, combined with empirical data collected from forty-three participants in this study, suggest that resilience to natural hazards is a function of two inter-related aspects: ‘information’ and ‘response’ mechanisms. Resilience information may arise from prior personal experience or through the receipt of information (resilience signal) to help shape the understanding of a hazard and what protective steps to take. This understanding prompts behavioral responses influenced by ‘risk attitude’, ‘skills’ and ‘access to resources’ to enhance the adaptive capacity of the receiver.

Community resilience enhancement programs should aim to develop programs that advance public learning, knowledge and understanding of a hazard before, during and after a disruptive event. Such a program should also aim to develop relevant resilience skills (e.g. physical fitness, critical thinking and innovation) and promote access to needed resources so that people can take steps to reduce the potential for harm or damage as a result of flooding. The focus on both ‘information’ and ‘response’ mechanisms are essential at all levels, both national and local and within groups that make up a community. This will require a shift in policy emphasis from a risk preparedness culture that focuses largely on engineering approaches and in the immediate period before a disruptive event, to one where social approaches (such as social learning, education, community engagement) are fully appreciated at all

disaster management stages and in national, local and community resilience planning and programs. The paper concludes that any resilience enhancement program that fails to acknowledge the importance of both aspects will limit the ability of individual residents, businesses and communities at large to maximize opportunities for enhancing resilience to natural hazards in local communities.

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